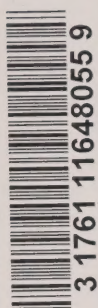


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PLANNING PROGRAMMING BUDGETING GUIDE

GOVERNMENT OF CANADA

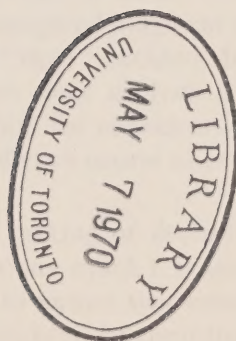
HONOURABLE C. M. DRURY,


PRESIDENT OF THE TREASURY BOARD,

JULY 1968

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INTRODUCTION

- 1 The Treasury Board has taken steps over the past few years to introduce a planning-programming-budgeting approach to resource allocation. This guide describes program budgeting in general and the details of the federal government PPB System under development. The guide is addressed particularly to the senior management of departments and agencies — deputy heads, their immediate assistants, directors general and the like — since it is at their level that program decisions have to be made. The term management, therefore, when used without qualification will always mean senior management.
- 2 This guide is the third in a series of related Treasury Board publications, the other two being the Financial Management Guide and the Program Review and Estimates Manual. The first was mainly concerned with promoting the effective management of financial resources through improved accounting systems and the latter mainly with the formal procedures to be followed in submitting budgetary proposals to the Treasury Board in a PPB context. Both gave a rudimentary treatment of the concepts of PPB.
- 3 One respect in which a PPB System is greatly different from traditional forms of government budgeting is in its concentration on the results or output and benefits as opposed to just a consideration of the resources required. Intensive study is made of feasible alternative ways of attaining defined objectives with a view to determining the approach which is most likely to achieve the greatest benefit for a given cost or, conversely, the approach by which a given objective will be achieved at minimum cost. A number of techniques have been found useful in such studies and the application of these techniques is properly the work of analysts trained in their use. As will be made clear, however, it is important for managers to have a good understanding of the techniques.
- 4 Much of the guide is, therefore, devoted to describing the techniques and the analytic processes in which they are used. Because the analytic processes can be quite complex, the chapters describing them have had to be made quite technical in their content. However, since it is managers and not analysts to whom the guide is addressed, this guide is not a “how to” manual. In addition, it would be unfortunate if the emphasis necessarily given to techniques of analysis were to create the impression that analysis is being presented here as a substitute for managerial judgment and that the application of the techniques leads automatically to the “right” decision. In a PPB System, analysis is expected only to promote better decisions since analysis is likely to bring forward a greater range of alternative courses of action for consideration by management and to make more apparent the probable effects of each course of action.
- 5 The manager remains responsible for the making of decisions. In addition, there are usually considerations bearing on the decisions which it is not possible to include in the analysis. While the analyst will endeavour to ensure that considerations of this kind are brought to the manager’s attention, the weight to be given them in deciding on a course of action is a matter for managerial judgment.

- 6 Other topics discussed in the guide are information systems to assist in the management of a program and in the provision of data for the periodic reassessment of decisions; the kinds of staff needed by departments in implementing a PPB System and factors to be taken into account in deciding on the location of that staff in the organization; the present state of implementation of the government's PPB System; and suggestions as to the steps departments should take in fulfilling their role in the System.
- 7 The adoption of an analytic approach to government decision-making of the kind that underlies planning-programming-budgeting is probably inevitable in a complex society. The minimum needs of shelter, sustenance, internal order and the like having been met, there are innumerable possible ways of improving the quality of life and not all the ways can be pursued at one time because of limited resources. Choices have to be made as to what should be done in the full realization that the choosing to do some things means that resources will be unavailable to do other things. The complexity of the considerations having a bearing on these choices invites the application of all that modern techniques of analysis and of gathering and processing information have to offer.
- 8 It is of the utmost importance that it be understood that the competition for resources extends to *all* the programs of government, even those in which the application of quantitative analysis is most difficult. In these latter instances, the analysis may have to be of a more qualitative kind, concentrating, for instance, on the clarification of objectives and a reasoned exploration of alternatives, on attributing numerical values to such factors as may be measurable, and treating factors that defy numerical expression by at least ranking them according to their importance in assessing the alternatives under review.

CHAPTER 1 – THE PPB PROCESS AND ITS OBJECTIVES

- 1 The concepts common to all planning-programming-budgeting systems are these:
 - (a) the setting of specific objectives;
 - (b) the systematic analysis to clarify objectives and to assess alternative ways of meeting them;
 - (c) the framing of budgetary proposals in terms of programs directed toward the achievement of the objectives;
 - (d) the projection of the costs of these programs a number of years in the future;
 - (e) the formulation of plans of achievement year by year for each program; and
 - (f) an information system for each program to supply data for the monitoring of achievement of program goals and to supply data for the reassessment of the program objectives and the appropriateness of the program itself.
- 2 The elements of the Canadian government PPB system have been developed in harmony with the above general concepts and within the context of total resource allocation. By the latter phrase is meant that there is an explicit recognition that the total resources are limited in terms of the individual and collective demands of departments and that there has to be a setting of priorities by the government itself in the light of which departments can plan and budget.

A Framework for Decision Making

- 3 Program budgeting is primarily concerned with resource allocation within the department. In common with much of the literature on the subject, the succeeding chapters of this guide emphasize the value of PPB to departments in making resource allocation decisions within their own spheres of responsibility.
- 4 However, in the final analysis, the resources to be allocated are those of the government as a whole – not the one million or two billion dollars with which an individual department may be concerned, but the whole ten billion dollars of revenues and borrowings that the government is currently spending. The Treasury Board is adopting PPB as a means to assist in *total* resource allocation. It is important then for departments to have an understanding of the whole framework into which their respective programs will fit.
- 5 The Treasury Board has adopted a functional classification of government expenditures which recognizes that government activity falls into six main areas or functions – General Government; Foreign Affairs; Defence; Economic Measures; Social Measures; and Education, Culture and Recreation. The expenditures involved in Fiscal Transfer Payments to the provinces and in Public Debt are set aside under two special functions. This system has three tiers at the governmental level, function, sub-function and functional program and, to the extent that individual departmental programs fall wholly within one functional program, they form a functional program. The individual programs that make up departmental programs should each fall entirely within a functional program and thus make up the fifth tier.

- 6 Appendices A and B illustrate this functional classification. The former itemizes the functions, sub-functions and functional programs. The latter shows a preliminary identification of departmental programs or activities to the functional programs they are apparently related to in the sense that the objectives of the programs and activities appear to be directed to the support of the functional program under which each is listed. The classification is of course not fixed for all time. It will require amendment as the pattern of government expenditures changes. Changes are also likely to occur because, as the concepts and techniques advocated in this guide become familiar and are put to use, new program-activity structures are likely to emerge which will call for a realignment of the functional relationships suggested in Appendix B.
- 7 Ideally there could exist a complete framework for resource allocation, one which begins at the level of the function where only the broad, intuitive, and in the truest sense "political", decisions can and must be made, and which extends down through the various levels of the hierarchy, with cost-benefit analysis exerting a progressively greater influence on resource allocation as the decisions to be taken fall within ever narrowing terms of reference. At each level there would be clearly specified needs to be met, identifiable results or outputs that could meet the needs, and measurable benefits that could be demonstrated.
- 8 Such an ideal state is, of course, not easy to achieve. At the higher levels of decision, it is not possible to rely to any great extent on cost-benefit analysis, in deciding for instance how much should be spent on defence as against social measures. And even after a decision is taken to spend a certain amount on social measures, the subsequent decisions as to what should be allocated to health and the other sub-functions are only comparatively easier.
- 9 Despite the difficulties, however, there must be at least an implicit functional allocation. A case could be made for higher levels of expenditure in almost every area in which the government operates. For example, the defence of Canada could take all the revenues of the Federal government if there were no other demands. The arts, the sciences and education could absorb many more hundreds of millions of dollars. Certain areas of the country contain pockets of poverty that only massive investments can relieve. The ever-growing concentration of the population into cities invites increasing attention to clogged transportation facilities, polluted air and water, and sub-standard housing.

The Setting of Priorities

- 10 It is axiomatic that if next year's resources are to be higher by a certain amount than this year's, expenditures for all purposes taken together can rise by no more than the same amount. And it is intuitively obvious that it would be more beneficial for the increase to be distributed unevenly among functions according to the exigencies of the period under review. In other words, expenditures should increase at a faster rate than average for some functional programs, should remain stable in others, and should actually be reduced in still others to free funds for higher priority purposes. Consequently, not only should departmental programs be viewed as competing with one another for a share of the total resources; each program should be viewed as competing with all other programs, belonging to the same or other departments.

- 11 A major element of the PPB system will be the development of guidelines as to priorities to be served in allocating resources. This guidance will be sought in the future from the by the Department of Finance and the Treasury Board, funds likely to be available for the next few years according to specific assumptions as to the rate of growth in the economy, tax rates, and the appropriate level of borrowing for budgetary and non-budgetary expenditures — subject of course to any overriding considerations as to the fiscal stance necessary to correct any imbalance in the economy.
- 12 The recommendations as to priorities will be based on analysis made of information from the various departments in preparing their Program Review Submissions, since these are expected to develop in the quality of their content until they provide by far the best single picture of the needs of the country in federal areas of responsibility.
- 13 Expenditure guidelines reflecting the scale of priorities established by Cabinet will be communicated to departments as soon as possible in the period during which departments prepare their Program Review Submissions. In those functional areas where the guidelines tend to be more restrictive, they should not be interpreted in any sense as ceilings that any department must follow. The Treasury Board cannot have a sufficiently intimate knowledge of the inescapable commitments that departments must meet or the low level of expenditure that is a by-product expected to result from new programs or from the expansion of existing programs. But in cases where the guidelines suggest restricted expansion or contraction in program size, the departments concerned have the advantages of an early notice that their arguments will have to be more than usually convincing and of an opportunity to reassess their own priorities and to consider internal priorities among activities.
- 14 At the same time, in those functional areas for which the guidelines suggest expansion will be favoured, no automatic acceptance by the Treasury Board of any particular budget level should be expected. Firstly, there are in many cases two or more departments responsible for operations in any one functional area and the distribution of resources among the departments concerned will depend on the relative benefits forecast. Secondly, even for those functional areas the guidelines might favour, the available new resources will certainly be inadequate to permit the realization of all plans, however meritorious.

Internal Departmental Priorities

- 15 A third element in the PPB System is an insistence that departments investigate and make explicit in their Program Review Submissions the scale of priorities they recommend for each program in the next fiscal year. That is, as explained in more detail in the Program Review and Estimates Manual, departments are requested to show what they consider most urgent or beneficial to be done within each activity and as between activities in the same program. The Treasury Board will take these priorities into account in reaching a balance between resources and demands upon these resources.
- 16 This consideration of internal priorities is expected to extend to recommending the elimination of existing activities whose continuance appears to provide a benefit insufficient to justify the funds required or whose elimination would release funds for

Support Programs and Activities

- 17 Some programs and activities of the government exist to provide service to other programs and activities and in fact some entire agencies exist for this purpose alone. Some of the literature on planning, programming and budgeting argues the thesis that only those operations providing a direct service to the public should be recognized as elements of program-activity structures, and that the costs of support operations should be distributed to those programs providing a direct service and, as a result, the support operations should not appear in the budget.
- 18 The Federal government PPB System is *not* being developed in accordance with this thesis. Support operations, either those of entirely common service agencies or those which are found in departments or agencies having other operations providing a direct service to the public, may at this time be accepted as programs or activities and as such may appear in the budget in the usual way; i.e. the more detailed suggestions about program-activity structures found in Chapter 2 will apply. Some methods of relating the cost of administrative and support activities to operating programs are briefly discussed in Appendix C. Future experience may indeed indicate that support operations should disappear from the budget but at this time the advantages of that approach do not appear to outweigh the difficulties.
- 19 The foregoing discussion is of course not intended in any way to prejudice any decisions about the merits of charging for common services; this might still be done whether or not the operations providing the common service are treated as programs and activities.

Systems Analysis

- 20 The term systems analysis is taken in this guide to include the whole analytic process of clarifying objectives, the defining of appropriate program-activity structures for the achievement of objectives and, in particular cost-benefit analysis. These three topics are covered in other chapters of the guide.
- 21 A basic assumption of the Canadian PPB System is that systems analysis is essential to the implementation and success of the System. Departments will be encouraged to set up small staff groups of analysts in a close relationship to the deputy head and his program directors. The Treasury Board will give the lead in the application of analysis. A new section in the Board's Secretariat has been staffed with a number of officers with professional qualifications and experience in the analytic disciplines. In addition to providing advice to the Secretariat of the Board, these officers will design training courses for departmental personnel and will be available for consultation with their opposite numbers in departments.

CHAPTER 2 -- OBJECTIVES AND PROGRAM-ACTIVITY STRUCTURES

- 1 A distinguishing characteristic of PPB is the reliance placed on analysis at all stages of the stage of setting objectives, in evaluating alternative ways of achieving objectives, during detailed planning to put in train the selected alternative, and during implementation to maintain control over progress. The analytic techniques used are not new but are borrowed from other disciplines and employed together in a PPB system to contribute to improved decision making.
- 2 It is convenient to explain the process called systems analysis* under the three topic headings: the clarifying of objectives, the design of program-activity structures, and cost-benefit analysis. These are the three steps in the analytic discipline which should precede and continue to support program budgeting implementation and they are in fact taken in the general order stated. Each "step", however, is unlikely to be taken just once but may recur a number of times. Tentative objectives are proposed and from these a set of potential programs are inferred. A first cost-benefit analysis is undertaken and this is likely to suggest the reconsideration of the potential objectives and their associated programs. These restated objectives would be expected to lead to more likely programs but further cost-benefit analysis may indicate the wisdom of a second reconsideration of objectives and programs. Since the process is intended to provide a basis for action and is not carried on for its own sake, it must, of course, be suspended at some point. The essential idea to be grasped is the iterative and integrated character of systems analysis, even though for expository reasons the three main divisions of the analysis are presented separately here.

The Clarifying of Objectives

- 3 As was said in Chapter 1, the government exists to discharge certain functions and each department in turn exists to contribute towards one or more of these functions. The first step in the implementation of program budgeting from a departmental point of view is the formulation of a statement of objectives which indicates which function or functions of government the department exists to support and what specific contributions the department makes or proposes to make. The statement of objectives is, therefore, fundamental in that the particular structure which evolves will be directly dependent on the objectives and the way in which they are stated. Successful planning is critically dependent on the clarity of objectives at all levels - governmental, departmental and the levels of departmental program, activities and sub-activities or projects carried on within the scope of each activity. In this guide departmental and program objectives only will be discussed but the considerations raised are equally applicable at lower levels of the structure.

* In some of the literature on PPB, the terms systems analysis, cost-benefit analysis, cost-effectiveness analysis and cost-utility analysis are used interchangeably though some writers have attempted to draw fine distinction between the various terms. "Systems analysis" is used here to refer to the whole analytic process including the clarification of objectives and the defining of programs and activities. In particular, systems analysis will include cost-benefit analysis. The terms, cost-effectiveness analysis and cost-utility analysis will not be used.

- 4 For each departmental program it is desirable to have a statement of objectives which meets the following criteria:
- (a) the objectives of a program should be compatible with each other;
 - (b) they should be directly translatable to explicit benefits, preferably to benefits that can be measured quantitatively;
 - (c) they should be stated in a way to encourage the consideration of a number of different yet feasible alternative activities, i.e., the objective should not define the method;
 - (d) they should be defined with enough precision to permit identification of any activity within a program which does not contribute to the objectives of that program; and
 - (e) they should be consistent with the department's role as set out in the legislation governing its operations.

The Process of Defining Program Objectives

- 5 There should be a short statement of the department's objectives which describes what part of the total government responsibility the department takes to be its particular responsibility.* Similarly, it is necessary to develop a series of sub-objectives leading to the division of the department's total responsibility into logically separate parts. When such a set of sub-objectives is finally decided upon, each sub-objective corresponds to a potential program.
- 6 It may be helpful to offer an illustration on the process as it has been explained to this point. The illustration is purely hypothetical and although it involves the subject matter of the Department of Agriculture, it does not necessarily represent the ideas of the Department of Agriculture. Suppose that a short statement of the Department of Agriculture's objectives ran as follows:

"To increase food production for domestic consumption and export and to promote the economic welfare of those engaged in farming in Canada." This statement appears generally consistent with the fifth criterion but it quite evidently is of too general a nature to meet the other criteria. The general departmental objective so stated might be clarified along the following lines into sub-objectives. (The names of possible programs the sub-objectives would suggest are shown in brackets after the sub-objectives.)

- (i) To determine methods of increasing productivity (Research);
- (ii) To stimulate consumption in Canada of Canadian grown agricultural products (Domestic Marketing);
- (iii) To enlarge overseas markets (Foreign Marketing);

* In some departments there are certain operations which it carries for good administrative reasons, but which are not consistent with its general responsibilities. The Post Office, for instance, sells Wild Life Permits & Unemployment Insurance Stamps. Such minor responsibilities do not need to be stated or even implied in the statement of departmental objectives.

- (iv) To eliminate or control insects, pests and diseases (Production and Quality Protection);
 - (v) To ease the farmer's disabilities arising from fluctuations in foreign markets and variations in production due to climatic conditions (Price Maintenance).
- 7 Analytic effort is then addressed to the activities of the department and the objectives of the activities are determined. Each activity is identified with the potential program the activity appears to serve and at the same time, preliminary consideration can be given to new activities, consistent with the departmental and program objectives. This could be either wholly additional new activities or new activities that would be preferable substitutes for some current activities. The consideration of new activities should proceed initially with minimum restraint in order that management may be given the opportunity to explore a wide range of alternative .

The Purpose and Desirable Attributes of Activities

- 8 A departmental program, or more briefly in this context, a program, is a group of departmental activities, all of which are directed to the achievement of the objective or set of objectives of a departmental program. The activities grouped are usually alternative or complementary means for achieving the objective or set of objectives and, therefore, the activities concerned should be considered together when major choices are made about the allocation of resources. There are a number of considerations that should be kept in mind.
- 9 First, the activity structure within a program must be designed to assist resource allocation decisions which are made within the department on the basis of analysis as well as outside the department by Ministers collectively as members of the Treasury Board and Cabinet. In many cases, the review by Ministers as a group may not go below the program level. However, when questions cannot be resolved at that level, the greater detail offered by activity documents will have to be considered. Ideally, policy and expenditure limits against which all submissions to the Board could be compared would be established by Ministers of the Board for each program, and by implication for each activity. Submissions clearly in accord with the agreed policy and expenditure limits would then become routine matters and be processed as such.
- 10 Secondly, the activities of a department are the headings under which the department will negotiate for funds with the Treasury Board, the headings under which requirements can be best explained and the benefits forecast. It will, of course, be necessary to show the interrelationships of activities within a program to provide a clear picture, but when this has been clarified, most of the detailed attention will be given to the activities individually.
- 11 Thirdly, the activities of a department provide the focus for planning by the department in deciding how to achieve program objectives. If a department carries on some large operation in each of several offices across the country, these offices are responsibility centres. But, if the operation no matter where it is carried on is directed to the achievement of one objective or set of objectives, the operation forms the activity. Therefore, the parts of a single activity may be found in more than one responsibility centre and, conversely, one responsibility centre may be concerned in more than one activity.

- 12 Fourthly, in order to avoid having too many activities, each activity should involve the largest set of projects possible as long as the objectives to be carried out are not too diverse, since it is desirable that an activity serve one, rather than two or more, objectives.
- 13 Fifthly, in delineating an activity, it is important to remember that for it to be meaningful, the mix of operations should be homogeneous in character. There is a natural tendency to solve accounting problems by choosing an activity structure that is identical to the responsibility structure despite the fact that the activities thus become a heterogeneous collection of operations. If this is done, discussions between the departments and the Treasury Board will tend to fall to the level of objects of expenditure, work volumes, and like details and the true activities of the department will become obscured in the organizational network. Discussions should be about policy, the objectives to be achieved and the appropriate total resource allocation. These can only be meaningful topics when the whole activity is viewed at once in relation to the program it supports rather than in small segments carried on by various responsibility centres.

Research Activities

- 14 Many programs are supported by research – research being defined as a creative activity which produces some form of innovation. These operations, like all others of government, are encompassed within the PPB resources allocation system.
- 15 If the resources involved are small and the research forms an integral part of a particular activity or departmental program, it will not be necessary to identify the research as a separate activity. Should the research incur large fractions of a department's budget it should be treated as a separate activity or activities. When the whole of the activity of a department is devoted to research, for example the National Research Council, it will be appropriate to submit a program made up of significant research activities.
- 16 Although justification for resource allocation to research activities must be argued in terms of potential benefit related to cost, the Board appreciates that applied research has more direct potential benefits than so-called pure research. Since the support offered by pure research is more diffuse it may have to lean for its justification upon broader benefits which may be associated with the development of national prestige, education, the attraction of trained people to Canada or the counteraction of the brain drain, etc. Applied research which is aimed at supporting specific objectives should include in its justification a clear statement of the particular sector of the Canadian economy it is intended to benefit.

Treasury Board Approval

- 17 Because the programs and activities of departments are key elements in the processes of analysis and resource allocation, the program-activity structure of departments will require approval by the Treasury Board, such approval to be sought in a specific submission to the Board. A well-defined program can very much simplify the Board's task in making allocation decisions and the department's task in long-range planning. A well-defined program in this sense is one in which the objectives are clearly stated and identify measureable benefits; in which the activities comprising the program are shown

to clearly serve the program objectives; and for which a reporting system has been devised to show at suitable intervals the progress being made in achieving objectives. In such a situation, it should be possible for the Board to consider a long-term commitment of resources, to be honored in all but very abnormal budgetary situations.

- 18 While, as was said, each program-activity structure will require Board approval, that approval will not necessarily be withheld in any particular case in which the structure is not well defined in the sense of the preceding paragraph. The collection of activities a department puts together to make up a program may require a resource allocation even though the collection does not fulfill the requirements set forth for a satisfactory program-activity structure. But such allocations will tend to be made on a year-to-year basis, following searching examination and will be subject to continuing review. It would not be surprising, however, if such a department, seeking funds for expansion, should find itself at a competitive disadvantage with another department able to justify its request for funds in terms of objectives and presenting its justification in terms of a well defined program-activity structure.

Program-Activity Structure, Objectives and the Estimates

- 19 The Treasury Board has approved a new form of the Estimates to be introduced for the fiscal year 1970-71. This new form will present departmental estimates in terms of programs and activities and will record the objectives which the programs and activities are meant to serve. For this reason, as well as for their vital significance in planning and implementation, the clarity of objectives is of great importance.
- 20 In the long term, it is intended that the appropriation structure match the program structure with each departmental program being financed by one vote. Considerations of parliamentary control may sometimes dictate the necessity for sub-votes related to activities or major elements of activity (such a large scale transfer payments) but the equating of the vote structure and the program structure should make more evident to Parliament the intended relationship between appropriations and results.

CHAPTER 3 — COST-BENEFIT ANALYSIS

- 1 The purpose of this chapter is to provide the manager with an appreciation of cost-benefit analysis and how it is performed in his role as system manager. To summarize the entire process, the following steps describe the operations which should be performed if the manager is to be able to make use of the analytical data. Thus after the program objectives are agreed the analyst should
 - (a) List and describe alternative ways of achieving objectives.
 - (b) Enumerate the principal benefits expected and the sources of costs.
 - (c) Devise appropriate measures, preferably in dollar terms, for these costs and benefits.
 - (d) Construct mathematical models for experimenting with the proposed alternatives. This involves:
 - (i) obtaining an understanding of how each proposed alternative will function.
 - (ii) identifying the key variables and the variables that can be neglected;
 - (iii) establishing the relationship between the key variables; and
 - (iv) gathering the data necessary to use the models in testing alternatives under various assumptions.
 - (e) Determine the costs of each alternative and place a value on the benefits produced by each alternative.
 - (f) Decide on decision criteria for ranking the alternatives.
- 2 Since the whole reason for the analytic effort in program budgeting is to assist the manager in decision making, the relationship of the cost-benefit analyst to the manager is not the usual one of expert to customer. The manager should not look upon the analyst as an expert who supplies advice which the manager can accept or reject. As will be brought out here, the analyst must have frequent communication with the manager before and during the decision-making process to ensure that the latter's judgement on many matters is reflected in the analysis. Leaving aside the technical knowledge and training insight the analyst is expected to have, he becomes an extension of the manager carrying out a task the manager would do himself given the time.
- 3 The manager thus needs to be aware of the principles that will guide the analyst, the conventional steps he will take and the meaning of at least some of the common terms. In Appendix D a simple example is presented of a classical application of cost-benefit analysis reduced to its bare essentials. The subject matter of this example is used to describe the methodology and to show the meaning of technical terms and it will show that even in the case of the highly idealized project, indirect costs and benefits arise by "spillover" effects, that is indirect costs and benefits which arise because the project under analysis cannot be isolated in its effects from the rest of the world.
- 4 It must be admitted that some projects may be extremely difficult to quantify but it can be argued that the very process of "stepping through" the analysis will be of great value to the decision maker. Even if the initial pessimism about the precise nature of the

conclusions reached is justified, the resulting partial analysis will lead to better decisions than no analysis whatever.

Managers with certain kinds of technical backgrounds will have an advantage in assuming the role spoken of above. They will, at the same time, find this necessarily a cursory treatment of matter with which they are familiar. There is a large body of literature on the subject, most of it dealing with case studies rather than general theory, and a selection from that literature is given in a bibliography at the end of the manual. All managers could, with profit, explore the material in the references provided, but it is hoped that the general treatment given here will make it possible for each manager to see how the techniques of cost-benefit analysis will be of assistance to him in reaching decisions.

Clarity of Objectives

The necessity to be clear about objectives must be brought out here again since, unless the objectives are the "correct" objectives, analysis may be a mere waste of resources and may even mislead. A surprising amount of the literature on cost-benefit analysis is concerned with the inadequacy of the method. Most of the criticisms made can be subsumed under the one criticism that the analyst or the manager, or more probably both, were not clear about objectives at the inception of the analysis and that the analytic process itself did not correct the deficiency.

The classical applications of cost-benefit analysis have been in the evaluation of plans for defence hardware and public investment in water resource projects. The example worked through in outline in Appendix D deals with an analysis of two alternative methods of carrying through a hydro-electric project. It will be immediately seen that the objective, as stated, has already assumed that the method of power generation would be by hydro and, while this may be valid in an example, in real life it would be necessary to assess these proposed solutions against the possibility of using fossil fuels or nuclear energy in a thermal power plant.

Discounting

In analysing any number of projects it is evident that neither the expenditures nor the benefits are likely to occur at precisely the same instant in time but instead there is likely to be a COST TIME STREAM and a BENEFIT TIME STREAM stretching some years into the future. A typical example might look like the curves illustrated in the figure and it is obviously necessary that values arising at different times be adjusted to some common base for comparison. Such an adjustment must recognize that costs which are incurred now are more onerous than future costs and, at the same time, benefits to be enjoyed now are more valuable than benefits to be enjoyed later. This adjustment is made by bringing all future values of costs and benefits to their PRESENT VALUE by some discount rate related to the cost of borrowing funds for the long term. The choice of the appropriate rates of interest to be used is discussed in more detail in paragraph 11.

Uncertainty

Future benefits can of course seldom be known exactly, whether it is growth in usage of National Parks, employment of adult trainees or demand for electric power. However, in

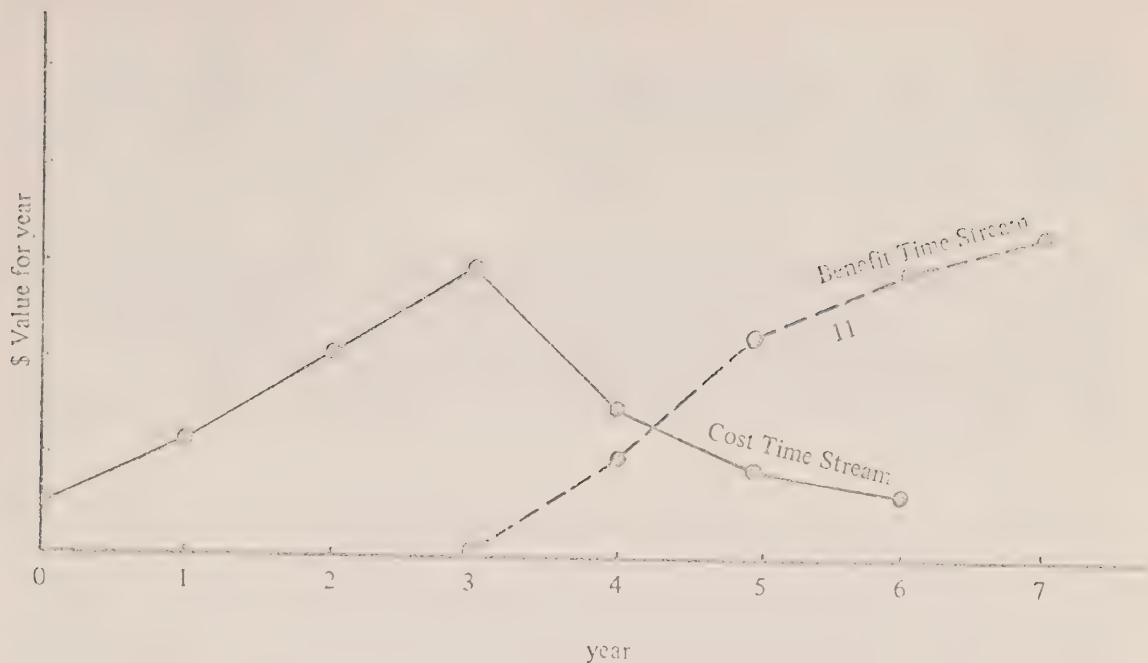


Fig 1

most instances the manager can estimate a range of values from most pessimistic to most likely to most optimistic. This is his range of UNCERTAINTY and must be differentiated from RISK, which is the probability of something not occurring at all

- 10 If variables in the analysis can assume a range of values, it is important to see how this uncertainty affects the overall value of all the alternatives. Suppose in a hydro-electric study there is some uncertainty about the future demand for power and there is a change in the order of preference of the projects depending on the power demand. If one of the projects is capable of incremental development, it may be possible to tailor its size to match future demands for power and this would make the net benefit less SENSITIVE to future demand than a project which can only be built in one size.

Discount Rates

- 11 In the discussion of present value, mention was made of the difficulty in choosing an appropriate discount rate. The rate at which the federal government can borrow money is not the only rate at which to discount costs and benefits for a government project. Ideally the rate should also take account of OPPORTUNITY COSTS of funds, that is the return they might yield in alternative uses, even the most favourable possible yields in the private sector. Pragmatically, the solution to the problem is to apply a standard set of rates of discount, taking as a lower limit an approximation to the long term government rate for borrowing and as an upper limit some arbitrary, higher rate. Specifically the rates to be used will be first the three rates 5, 10, and 15%. Should it transpire that the ranking of alternatives is insensitive, that is remains unchanged, when these three different rates are used, it is unnecessary to proceed further in this aspect of the analysis. Should it be determined that the ranking changes or the project reaches a breakeven point within one of the two intervals, 5 to 10% and 10 to 15%, the critical rate at which this occurs should be made known in the report of the analysis.

Benefits and Their Measures

- 12 Most case studies in the literature tend to be over-simplified and some of the most significant problems normally encountered in cost-benefit analysis are skated over lightly. There are the problems of indirect costs, indirect benefits and placing a monetary or other value on both costs and benefits.
- 13 Any program or activity which is undertaken will probably have more than one identifiable benefit or source of costs. A major hydro-electric power dam may provide the additional benefit of flood control but at the same time valuable farm land may be lost. At a secondary level the project may create a lake for water skiing and swimming while at the same time destroying marshlands valuable for wild fowl and streams for fishing.
- 14 A further interesting example which can be cited to illustrate some of these problems is the adult education program. One common approach in this area is to compare lifetime earnings of people of different standards of education, calculate the present value of this benefit and compare it with the present earnings. Some studies make allowances for changes in rates of unemployment, family and social benefits etc. However, it must be appreciated that unless there are job vacancies for the trainees to move into, they will either still be unemployed or displace someone else. Thus the assessment of benefits is complicated by changes in the pattern of unemployment, which may be a desirable objective in itself, and the multiplier effects of the potential earnings on the economy.
- 15 Ideally, in analysis all sources of costs and benefits, direct and indirect, will be presented in monetary terms. This permits the comparison of projects with widely different end products - for example, the energy generated from a hydro project and the improved transportation facility offered by a new road.
- 16 When a number in monetary terms cannot be attached to an end product, it is often possible to use some other numerical measure in comparing alternatives. Where one of the objectives of a program is to save lives a clearly valid measure of benefit is the number of lives saved. When a program or activity objective can be defined with sufficient precision to express the principal desired output as a single type of "commodity" such as a life, then the number of such units provided by an alternative is a measure of that alternative's effectiveness. Thus if the choice to be made is between a number of possible alternatives all producing the same output, even if it is intangible, so long as the product or service supplied is both recognized and quantifiable it will serve as a measure for rating the alternatives.
- 17 While this approach may be acceptable within a department or for some of a department's programs, any manager trying to allocate a given budget among competing programs with diverse outputs may be faced with the problem of INCOMMENSURABLES. That is, the output of each program may be clearly stated and expressed in quantified terms but the different outputs may have no apparent common ground which will permit meaningful comparisons to be made. For example, the output of program A may be the number of lives saved due to health care while the output of program B may be additional years of schooling provided to a particular group in society.

- 18 In such cases every effort must be made to find a common denominator to which all benefits can be reduced. The most useful common denominator is money and the exercise of ingenuity can make this measure applicable in some cases where it might seem unlikely at first glance.
- 19 For an adult training program the output is clearly an increase in skills of persons trained. The objective is economic and the most desirable measure of benefit would be the growth in the national product attributable to the increased level of skills on the part of the work force trained. This is not directly measurable. The measure chosen was the difference between the discounted life time earnings of the trainee's occupation at entry and those of the occupation for which he is trained. This provides an instance of a substitute or PROXY measure.

Models

- 20 In every cost-benefit analysis there will be a mathematical model implied or explicit. A model in this context is a rule or set of rules which establishes the relationships between variables and allows the estimation of benefits and costs involved in an alternative. In the simple illustration of the hydro-electric project, where there is only the one benefit to be considered, i.e., the units of energy produced, the number of units expected would be estimated from the engineering calculations and the measure of benefit derived by applying the price at which it was expected the units of energy could be sold. Similarly the costs would be derived from standard engineering estimating techniques. These engineering techniques are, of course, also models.
- 21 For many problems there will be no standard estimating technique in existence and the analyst will then find it necessary to establish a set of rules for the problem at hand, possibly taking the form of a set of mathematical equations. A complete mathematical formulation of the problem based on accepted theoretical relationships would be ideal. In practice the model is a partial representation of reality which closely duplicates how the proposed alternative will react under different conditions and assumptions. To do this, it must include the key variables which affect the performance of a proposed system both in producing benefits and in incurring costs and will have to express correctly the relationships between these variables. Sometimes the model may best take the form of a simulation employing a computer and such simulations are now being used widely. A Canadian university is using one to study its own administrative problems regarding space requirements, course enrollments, staff loads, etc. Simulation is also used extensively to arrive at optimum mixes in day to day oil refinery operations and has provided a basis for setting a price support policy for the uranium industry.
- 22 The great advantage of a computerized model is that it gives the analyst the capability of running numerous trials and sensitivity analyses to investigate the ranking of many alternatives under a host of assumptions. Where the rules governing the determination of costs and benefits cannot be expressed in mathematical form, either analytically or through simulation, the model may have to consist of a set of rules which expresses in words and numbers the relationship between the variables as these relationships are best understood.

The Need for Data

- 2.3 As will be evident from several points raised in this chapter, the quality of analysis will depend very much on the quality of the data going into the analysis. When a model is used for sensitivity testing, it is necessary to substitute actual values for the variables. If the model is well structured, it will directly indicate all the information requirements, which may however often not be readily available in an accurate form. The choice must then be made of waiting until data is available through properly designed statistical methods or of substituting estimates based on incomplete data on a temporary basis to obtain preliminary results.
- 2.4 In carrying out an analysis to decide between competing alternatives, the second is the preferred choice. It is often sufficient for the decision maker's purposes that he be given estimates of the range in which benefits and costs are expected to fall unless the alternatives under study are very close competitors. This does not mean that careless statistical estimation techniques are acceptable, but only that when time is short, the responsibility of the analyst is to do the best he can within the time span allotted and to inform management of the uncertainties associated with his estimates. It is a management decision whether more time and money should be spent on improving the estimates. The analyst can assist in this area by using his model with a sufficiently wide range of variables to help determine which of the variables cause wide fluctuations in system output and to which variables the output is relatively insensitive. Thus any extra effort can be concentrated on improving the knowledge about the more significant variables.
- 2.5 Once a decision has been made as to the alternative to be adopted, the question of costing takes a new form. The estimates now required must be accurate since they will form the basis of requests for funds in Program Review submissions. Overestimates in costing at this stage will cause diversions from other activities that could have been profitably pursued while underestimates will, at a later stage, lead to diversions from other activities or to unwelcomed reductions in the originally chosen scale.

Benefit-cost Decision Criteria

- 2.6 A decision to select one alternative from a number is made according to some criterion or criteria. In the simpler situations where all costs and benefits can be expressed in a common unit, which for most purposes is a monetary unit, the alternative chosen will be that providing the greatest net benefit (Net benefit equals Present Value of the Benefit Stream less Present Value of the Cost Stream) or the highest benefit-cost ratio. Where costs can be expressed in dollars and benefits only in some non-monetary terms, the decision can be reached by fixing the budgetary limit and choosing the alternative which maximizes the benefit. Conversely, a minimum acceptable level of benefit can be set and the lowest cost alternative chosen. In an Emergency Measures Program directed to the preservation of life, the number of lives likely to be saved is a most appropriate measure of benefit and it is not necessary in that context to attempt to place a dollar value on the benefit.
- 2.7 The criterion of the benefit-cost ratio or the greatest net benefit should not be applied mechanically. As the tabular presentation in the hydro dam project illustrates (Appendix D), any alternative that can be undertaken at different scales may have more than one

benefit-cost ratio and more than one value for net-benefits. Thus the choice between alternatives cannot be divorced from questions of the minimum level of benefits considered acceptable or indeed of the total costs that would be required.

Other Decision Criteria

- 28 An alternative may satisfy the objective and have the highest net benefit to cost ratio, and still not be chosen. There are often other constraints having a bearing on the decision. For example, a choice may be subject to consideration of the effect on the balance of payments, the promotion of Canadian industry, the impact on depressed regions, and to the restraint that the activity will have to be operated by personnel presently on strength in the department. If such conditions and restraints are to have a bearing on the decision maker's eventual choice along with the benefits and costs arrived at through the analysis, the analyst should be made aware of them at an early stage so he can furnish information on them to the decision maker. The decision maker should attempt to make clear the weights these additional criteria will have relative to each other and to the primary criterion, the benefit-cost ratio or net benefit.
- 29 There may also be other overriding criteria of which the most common is an upper limit on the total funds available for a project. Knowledge of an overriding criterion permits the analyst to eliminate from consideration at an early stage, and prior to detailed analysis, any alternatives which fail to meet the criterion.

Technical Monographs

- 30 As was indicated at the beginning, the object of this chapter was to convey an appreciation of cost-benefit analysis suitable for the managers and therefore no attempt at rigor or completeness was made. It is planned to remedy this deficiency in a series of technical monographs, directed to technical staffs of departments engaged in program analysis.

CHAPTER 4 – MANAGEMENT CONTROL

- 1 This chapter deals with the subject of control as it relates to the achievement of program objectives. Because control is exercised through information, something will be said about management information systems and general data needs for program budgeting. Each is a topic of much significance in its own right but the treatment given here must, of course, be restricted to what need be said about control and management information systems as they bear upon program budgeting. Each topic will be dealt with in summary form first and then later dealt with separately in more detail.
- 2 Management control consists in taking action to ensure that steps are going forward as planned to achieve the objectives decided upon, it being assumed that there is an operational plan to which progress can be compared at appropriate intervals. Reports produced through a management information system show or permit a comparison of progress to planned achievement. A management information system can as well generate much information for cost-benefit analysis which might lead to adjustments of plans on the basis of better data.
- 3 The chapter will also refer to problems in analysis occasioned by the absence of data and offer some suggestions about circumventing such problems.

Management Control

- 4 The systems analysis process is carried out to arrive at a decision about the course of action to be taken in satisfying specific objectives. Since the course of action is to take place in the future, there must exist uncertainty about its outcome. The manager must then require that an appropriately detailed operational plan be prepared, indicating stages of progress or intermediate goals to be reached towards the attainment of the objectives. From time to time, he will want reports which show a comparison of performance against goals. If the reports show that, in fact, expected performance is not taking place, he will have to decide whether the attainment of objectives is being jeopardized and whether he must shift resources or allow adjustment to the schedule. He may, of course, decide that the difficulties are more fundamental and that the assumptions made in analysis have been disproved to the extent that new analysis is required in the light of better and more current information.

The Types of Control

- 5 There are two kinds of control – one output oriented and the other input oriented -- that is, one emphasizing steps taken to promote the achievement of chosen objectives of a program and the other emphasizing expenditure limits that are not to be exceeded or statutes or regulations that are not to be violated. One is achievement control and the other is resource control. Resource control as defined here is well known to government managers. Whatever specific form this type of control may take it is required because:
 - (a) the control by Parliament over votes and over cash appropriated is paramount in our political system;

- (b) some initial or primary segmentation of votes by major levels of responsibility or by activity or the like will be made and some control over the financial and personnel resources allotted to these segments will have to be maintained; and
- (c) where a contract or some other form of covenant is made that requires payment in the future some record of the commitment is likely to be necessary to avoid over-commitment.

- 6 All these elements of a resource control system can be put in place and meticulously observed without there being provided any assurance that the manager will be made aware of progress in achieving objectives. What is, therefore, needed in addition is a system of achievement controls that will bring to the manager's notice any divergence of a serious nature between actual outputs and planned outputs in each activity.
- 7 There are now produced for some departments periodic reports showing expenditure by activity and the variance for the month and year-to-date between what was expected to be spent and what has actually been spent. These reports, broken down by some object of expenditure groupings, can sometimes show one or more operations in the activity to be out of control. A large variance must mean that a great deal more money or a great deal less money has been spent than was planned, suggesting underestimation of real needs or achievement of greater progress than had been expected. But reports at the activity level and in money terms only will not answer the manager's requirement to be informed.

The Content of Reports

- 8 What is needed for each operation within each activity is a statement of planned outputs or results for the period against actual outputs and results for the period. While the alternative chosen after analysis may be one which is expected to return the greatest net benefit or which shows the highest benefit cost ratio (subject to the other decision criteria of scale, budgetary limits, etc.), it may not be possible in all cases to devise a reporting system that reveals directly the achievement of benefits in a satisfactorily short period of time. It may be necessary to build control reports around units of input or of intermediate output from which the final outputs or benefits are expected to result. The final outputs or benefits may not be directly measurable in themselves or their achievement may require too long a lapse of time to be meaningful as a reflection of progress during implementation of an alternative. The following examples are meant to illustrate the foregoing points.
- 9 Assume an analysis undertaken to decide on the best way to provide a transportation link between two points. The benefit to be measured is the convenience offered to an expected flow of various kinds of traffic. The alternatives considered may be a new road, an expanded train service, or the re-routing of an airline. Suppose the analysis leads to the conclusion that a new road system is preferred. The operational plan is likely then to take the form of a schedule for the construction of a road. The manager will want reports of how efficiently the road construction is being carried out and how well budgetary limits are being observed. In the course of implementation then, he is able to satisfy himself only as to intermediate outputs and to control resources going into construction but not to satisfy himself that the expected benefits will in fact become manifest.

- 10 It may transpire that when built the road system does not bring anything like the flow of traffic expected and that it is now apparent that a serious overestimate of demand was made. This does not necessarily mean the analysis was invalid on the basis of the information supplied, but it does illustrate the difficulty in some cases of estimating the achievement of benefits. In this first example the costs have been fully incurred before any corrective action could be taken.
- 11 Consider as a second example a decision to open a new trade promotion office in a country where Canada has not previously had representation for this purpose. The decision is taken on the assumption that a 10 per cent increase in our exports to that country will take place. Assume also that it is decided to maintain the representation only if an appreciable improvement in exports is made. The manager in this case will in time receive reports of actual trade volumes and compare them with volumes obtaining prior to the opening of the new office. In this example the benefits can be measured directly but again only after a long time lag. It is therefore necessary in the short term to base the reporting system on some measure of work volume, such as inquiries received from prospective importers and referred to exporters in Canada. In time, if it becomes evident that trade is not developing to the extent that justifies the continuation of the post, the post may be closed before the full costs of the plan have been incurred. In this respect there is a difference between this and the first example.
- 12 In a third example the benefit may be simply an improved service to the public. Suppose that a type of permit had in the past to be obtained by mail at considerable delay and inconvenience and that it is decided to open offices in a few major cities where the permits may be obtained in person directly upon application. The direct measure of benefit is the number of members of the public who use this method of procuring permits and this measure may be reported on daily, weekly or monthly as desired to permit a very prompt evaluation by management of the success of the system.
- 13 The internal administrative services of a department responsible for supplying material or for supplying personnel resources are also often amenable to direct and prompt measurement. Reports on the number of orders for materials or the number of requests for new appointments that remain *unfilled* after a specified and reasonable length of time provide useful negative measures of achievement upon notice of which the manager can take corrective action.
- 14 These examples are meant to illustrate that management control reports need to be custom tailored to the circumstance of each activity, that it may be necessary to settle for measures of intermediate outputs in complex situations rather than measures of the expected benefit. The control reports should also guide the manager to a reassessment of a chosen course of action where there are indications that expected benefits are not being realized.

Management Information Systems

- 15 Probably all departments and agencies as they set out to implement FPM will find they are faced with a lack of information at every turn. They are unlikely to have even clearly stated program objectives. They will almost certainly have insufficient data from which to derive estimates of the costs and benefits of alternatives they will want to analyze. The quality of planning and analysis must, therefore, if for no other reason, fall short of a high level of attainment. Costs will be inaccurate, benefits estimates may be little

better than guesses, criteria for selection between alternatives will lack discrimination, and sensitivity to assumptions will be very high. While the initial problems may be unavoidable, the shortage of information does not provide an acceptable excuse for delay in introducing PPB. There will be *some* kind of data base to be exploited and the systematic application of PPB principles even on a deficient data base is likely to enhance the quality of decision making. The full returns from the PPB system, however, can only be enjoyed after there has been put in operation an information system which provides data to support analysis and control.

- 16 The term management information system has at present a certain vogue and is applied to everything from a simple set of more or less regular typewritten reports to as yet largely speculative data banks into which flow all data about all the events occurring in an organization as the events occur and from which it is possible to obtain on demand a wide variety of pre-analyzed up-to-the-minute reports of the status of organization. These elaborate, instant-response, data banks may come to be seen as necessary and feasible for some government operations. But, for the time being, much advantage can be had from less ambitious plans to use computers where their use is dictated by some combination of large data volumes, the need for pre-analysis and a quick response schedule – the latter being measured in days after the event rather than seconds.
- 17 More specifically, that part of an information flow in a department that is handled by a management information system will be characterized by its being produced regularly (weekly, monthly, quarterly, or annually) in a fixed pattern, in prescribed units, and according to a pre-determined plan whether a computer is employed or not. Much of the information the manager will use in controlling performance will flow from the management information system. And, in addition, the management information system will produce data for the on-going work of program analysis. Its value in this regard can be increased if the system is used purposefully to gather data for analysis which it is intended to conduct in the future. However, any information system, whether designed to do so or not, is likely to add to the analytic data base.
- 18 On the other hand it is uneconomical and unnecessary to burden the management information system with the task of gathering *all* data needed in analysis for a number of reasons. Some data are needed only once or from time to time and can be gathered by special surveys. The data desired may already be available from another department or other source. Where neither of these two ways of satisfying a data need are open, there may exist a serviceable approximation or rough methods may be used in securing such an approximation.
- 19 For instance, if the operations followed in carrying on two activities are intermingled, it will be necessary to estimate the costs attributable to each. But this may have to be done only at long intervals in a static situation. A random sample study of the kind with which work measurement specialists are familiar can quickly supply data of sufficient precision. It is probably unnecessary to trace each dollar. In one office where a distribution of the time spent on each of several kinds of work was wanted, each clerk was supplied with a numbered card for each kind of work. The clerks were instructed to display the appropriate card when engaged in a given kind of work. At selected intervals, a junior work study technician toured the area and recorded on a prepared form the count of cards of each number he saw. Over a two-week period the distribution of work according to kind was known with accuracy and the total clerical costs could be apportioned between the operations.

- 20 Before undertaking the cost of collecting data on some variable, thought should be given to using information already available on some nearly equivalent variable. For example, interprovincial movement of *all* family units may be sufficiently well reflected for many purposes by interprovincial movement of family units in receipt of Family and Youth Allowances. The latter is a readily available statistic. In the Emergency Measures program, already accepted estimates of extra cost for the protection of buildings against earthquakes might also be accepted as estimates of the costs of protecting buildings against blast effects.

CHAPTER 5 -- ORGANIZATION AND STAFFING

- 1 Each department and agency, except some of the smaller ones, will be expected by the Treasury Board to have in its organization a unit whose sole responsibility is the analytic work associated with program budgeting. The unit will be referred to here as the program analysis unit. Since there is no single best answer to the question of where the unit should be lodged in the organization, this chapter will attempt to guide rather than prescribe.
- 2 Because of the emphasis placed on PPB being the major decision tool for senior management there well might be an intuitive tendency to require that the chief of the program analysis unit report to the deputy head. This arrangement may well be the optimum solution in certain circumstances; it is not to be rejected out of hand. But, before it is adopted, consideration should be given to a number of factors.
- 3 For reasons of varying weight, it may be desirable to have the chiefs of many staff organizations reporting direct to the deputy head, such as the chief financial manager, the chief personnel officer, the chief of an organization and methods division and so on. But there is some practical limit to which a span of control can be extended. A deputy head may have also in direct line of reporting assistant deputy heads or directors general or both in charge of operational, administrative, or research branches; executive assistants; policy advisors; and headquarters staff specialists on the particular operations the department carries on. All these, and the enumeration is not exhaustive, will already vie for his attention. Since it is of ultimate importance that program budgeting have his attention, and a great deal of it, the new unit might be more successful if it is placed under the immediate charge of someone who already has a major responsibility for advising the deputy head on operational planning and achievement matters rather than if it is set up independently as an entirely new contender for notice. But the separation between the deputy head and the chief of program analysis should be no greater than one level of reporting.
- 4 A further consideration in the same general context is that while PPB theory as put forth in preceding chapters does, in general, provide a more systematic way of clarifying objectives and applying analysis to assist the achievement of objectives than appears to have existed before in government departments, planning did not start with PPB. If the department already has a well established planning division whose scope covers the whole range, or almost the whole range of the department's operations, the function of program analysis might well be located in that division, though the division would have to be given a new program budgeting orientation.
- 5 It is important to appreciate that such a planning division referred to above is not one concerned with the essential purposes of the department and not just its housekeeping. A department concerned with the provision of some service to the public may well have a division to plan how that service may be most effectively supplied -- that is to establish the need for the service, the conditions of eligibility, the best distribution of benefits given the funds available, etc. But it may also have another division to plan how the service may be most efficiently supplied -- a division to develop

work standards for clerks, to design appropriate forms, to develop office layouts and work flows. The first is the kind of planning division where it could be appropriate to vest program analysis.

- 6 The new unit *could* be placed in the administration service of a department but before this is done, careful thought should be given by the deputy head to the kind of administration service he has. To draw upon a military analogy, most administration services, particularly those in large departments with several programs, are largely taken up with manning and logistics. These administration services react to and attempt to make possible the fulfillment of plans, but have usually only a small part to play in the formulation of plans. It would be a mistake to place program analysis in administration in such circumstances.
- 7 The companion volume to this, the Program Review and Estimates Manual, suggests the intimate connection between financial management and program budgeting. To reiterate a theme from Chapter I, program budgeting is being adopted to assist resource allocation, to promote the optimum deployment of the available financial resources of government. The formal presentation of the department's annual request for funds in the Program Review submission is usually the responsibility of the financial management division; the Program Review submission is the culmination to that date of the work in program analysis. In other words, the Program Review submission translates into dollar and man-year terms the resource requirements determined through analysis. There must then be co-ordination between whatever division is responsible for program analysis and the financial management division. The former must, for instance, look to the latter for information necessary in costing as well as for an indication of many of the financial constraints planning should realistically take into account.
- 8 The deputy head may decide that he wants the closest possible co-ordination between the two functions and decide to place the program analysis unit in the financial management division. But he should do so only if the latter is now in direct line of reporting to him and if it now plays a major part in planning. A director of financial management, even one at the required reporting level, whose orientation is heavily on the purely accounting aspects of financial management, may not be the appropriate bridge between the deputy head and the small group of economists, mathematicians, and engineers who will ideally make up the program analysis unit. There may be complex stores or revenue producing operations to absorb all his attention to the disadvantage of the analytic side and this is likely to inhibit the kind of rethinking of fundamental issues that PPB should promote.
- 9 These then are the factors the deputy head of each department and agency should bear in mind when deciding on the appropriate reporting relationship. Taking all these factors into account an arrangement which may commend itself to the deputy head is one under which the financial management, the information systems, the operational review, the organization and methods and the program analysis functions would all be assigned to a "Director of Program Analysis and Finance" who, in turn, would report to the deputy head.

Staffing

- 10 The program analysis unit should be started on a small scale and deliberately kept small. Of course, certain smaller departments and agencies are unlikely to warrant separate

units of this kind. The number of officers required will vary in the other departments according to the department's size and the number and variety of programs they carry on. To make the point clear but without suggesting limits that should be exactly observed, the number of officers required could be as few as one or two and as many as eight or ten.

- 11 The primary reason for emphasizing that the staff be kept small is the desirability that the unit remain a closely knit group having a shared understanding of problems under study. Much of the work they will do, in the early stages of a study in particular, will take the form of extended discussion as the widest range of alternatives are brought forward and examined for feasibility. The larger the staff, the less the understanding can be fully shared and the more formal and less free ranging the discussions will be forced to become.
- 12 From another stance, a limit in size should be accepted because of the difficulties that will be met in finding officers suited to the work. A good analyst is likely to be one who has undergone training in some disciplined approach to problem solving and who combines a fertile imagination with at least an appreciation for quantitative methods. The usual disciplines are economics, mathematics and engineering but it would not be unusual to find analysts with other backgrounds. In any case, unless he is a junior in training, the analyst should have had experience in the application of his specialty or specialties in a way to develop his analytic abilities. In addition, because of the necessity to communicate with management, each should have the ability to express himself orally and in writing on technical subjects without obscuring his meaning in the special vocabulary of his technical specialty.
- 13 The group should include a mixture of disciplines, not only because a complex problem may require attack with weapons drawn from different disciplines, but because the same problem can appear differently to a mathematician, an economist, and an engineer, and the different approaches they will be inclined to take are more likely to produce the best solution than a single approach.
- 14 It would be well too if some of the officers placed in the unit had long and varied departmental experience and if the others had not. The former would bring a knowledge of the department's subject matter and of practical restraints that must be observed in considering alternatives. The latter would tend to widen the probably more restricted vision of the former since the outsider will have to question as he learns about the department. He will also be more likely to raise for consideration radically new alternatives. Those with a knowledge of an existing program are often those whose view of difficulties and the potential for change has been severely conditioned by their experience.
- 15 From time to time, the capability of the analysis unit could with profit be supplemented by outside consulting service drawn from the Bureau of Management Consulting Services, universities, or commercial management consulting firms. Going back to the remark in Chapter 3 that the analyst is to be an extension of the manager, it is important that outside consultant service be used wisely and this means that the problems given to consultants are to be well defined. The definition of objectives, the assumptions and the judgement underlying analysis are in the end the manager's responsibility. The next component, knowledge of subject matter, is, in the nature of

things, more likely to be had by departmental personnel. The consultant can bring a knowledge of *techniques* but unless he is given an appropriate problem area for the application of techniques, the results are unlikely to be worth the money paid for his services. An extensive and early reliance on consultants without effort being made to set up a program analysis unit amounts to putting off a step that has to be taken eventually. The process of analysis will go on and it requires the continuity that a departmental unit can give, and a consultant cannot, over the long term.

APPENDIX A – THE FUNCTIONAL CLASSIFICATION

The classification has three levels – functions, sub-functions and functional program, indicated below by the successively greater indentations

GENERAL GOVERNMENT SERVICES

LEGISLATION AND ADMINISTRATION

- LEGISLATIVE
- EXECUTIVE AND POLICY
- COLLECTION OF TAXES AND DUTIES
- INTERNAL MANAGEMENT SERVICES
- CONTRIBUTIONS TO EMPLOYEE PENSION AND MEDICAL PLANS
- CONTINGENCY VOTE
- NATIONAL CAPITAL REGION
- BULLION AND COINAGE
- OTHER LEGISLATION AND ADMINISTRATION

PROTECTION OF PERSONS AND PROPERTY

- JUSTICE
- CORRECTIONAL SERVICES
- POLICE PROTECTION
- CONSUMER SERVICES
- OTHER PROTECTION OF PERSONS AND PROPERTY

FOREIGN AFFAIRS

EXTERNAL RELATIONS

- DIPLOMATIC RELATIONS
- CONTRIBUTIONS TO INTERNATIONAL ORGANIZATIONS

ASSISTANCE TO DEVELOPING COUNTRIES

- OTHER FOREIGN AFFAIRS

DEFENCE

INTERGOVERNMENTAL FISCAL TRANSFER PAYMENTS

- STATUTORY SUBSIDIES TO PROVINCIAL GOVERNMENTS
- REVENUE EQUALIZATION PAYMENTS
- OTHER FISCAL TRANSFER PAYMENTS

ECONOMIC MEASURES

PRIMARY INDUSTRY

- AGRICULTURE
- FISHERIES
- FORESTRY
- MINERALS
- WATER RESOURCES
- ENERGY
- OTHER PRIMARY INDUSTRY

SECONDARY INDUSTRY

TRANSPORTATION AND COMMUNICATIONS

- AIR TRANSPORT
- WATER TRANSPORT
- RAIL TRANSPORT
- ROAD TRANSPORT
- POSTAL SERVICES
- TELECOMMUNICATIONS
- OTHER TRANSPORTATION AND COMMUNICATIONS

SERVICE INDUSTRY

- TOURISM
- OTHER SERVICE INDUSTRY

FOREIGN TRADE

LABOUR FORCE

- WORKING CONDITIONS
- TRAINING
- IMMIGRATION
- OTHER LABOUR FORCE

GENERAL RESEARCH

- SOCIAL SCIENCE RESEARCH
- PHYSICAL SCIENCE RESEARCH
- OTHER GENERAL RESEARCH

HOUSING AND URBAN RENEWAL

- Regional Development

OTHER ECONOMIC MEASURES

SOCIAL MEASURES

HEALTH

- PUBLIC HEALTH
- MEDICAL CARE
- HOSPITAL CARE
- OTHER HEALTH

INCOME MAINTENANCE

- PAYMENTS TO AGED
- PAYMENTS TO FAMILIES
- PAYMENTS TO UNEMPLOYED

SOCIAL ASSISTANCE

- CANADA ASSISTANCE PLAN
- AID TO HANDICAPPED
- OTHER SOCIAL ASSISTANCE

VETERANS BENEFITS

INDIANS & ESKIMOS

OTHER SOCIAL MEASURES

EDUCATION, CULTURE & RECREATION

AID TO EDUCATION

- POST SECONDARY EDUCATION TRANSFER
- OTHER AID TO EDUCATION

CULTURE AND RECREATION

- ARCHIVES, GALLERIES, MUSEUMS, LIBRARIES AND THEATRES
- PARKS, HISTORIC SITES AND OTHER RECREATIONAL AREAS
- FILM, RADIO AND TELEVISION
- OTHER CULTURE AND RECREATION

PUBLIC DEBT

FINANCIAL TRANSACTIONS

FUNCTION			General Government		Economic Measures					
SUB-FUNCTION			Legislative and Administrative		Transportation and Communications					
FUNCTIONAL PROGRAM			Internal Management							
DEPARTMENT	SELECTED PROGRAMS	SELECTED ACTIVITIES			Air Transport	Water Transport	Rail Transport	Telecommunications	Labour Force	Immigration
Manpower and Immigration	Manpower									
	Immigration	All								○
Transport	Air Services	Radio Act and Regulations						○		
		Meteorological Services								
	Railways and Steamships	All other			○					
		Subsidies to Railways					○			
		Subsidies to Ferries				○				
National Health and Welfare	Medical Services	Civil Aviation Medicine			○					
		Indian Health								
		Civil Service Health		○						
		Immigration Medicine								○
		Sick Mariners Service				○				

APPENDIX A

Chart Illustrating relationships of functions, sub-functions, functional programs and departmental programs.

APPENDIX B

EXPENDITURES ON PROGRAMS AND ACTIVITIES OF DEPARTMENTS AND AGENCIES, 1967-68 CLASSIFIED BY FUNCTION

GENERAL GOVERNMENT SERVICES

(millions of dollars)

LEGISLATION AND ADMINISTRATION

Legislative

House of Commons	14.3
Senate	3.4
Library of Parliament	.6
Chief Electoral Officer	.3
Representation Commissioner	.1
Auditor General	2.3
	<u>21.0</u>

Executive and Policy

Governor General and Lieutenant Governors	1.0
Privy Council Office Administration	3.7
Finance Administration	3.9
Treasury Board Administration	4.6
Royal Commissions	2.7
	<u>15.9</u>

Collection of Taxes and Duties

Taxation (NRT)	57.8
Customs and Excise (NRCE)	59.0
Tariff Board	.5
Tax Appeal Board	.3
	<u>117.6</u>

Internal Management Services

Language Training	5.0
Public Service Commission (excl. Language Training)	7.9
Public Service Staff Relations Board	1.0
Public Service Health (NIJW)	.8
Accommodation Services (DPW)	133.9
Supply (DDP)	7.6
Purchasing (DDP)	9.4
Project Management (DDP)	3.0
Public Printing and Stationery	4.8
Comptroller of the Treasury	32.1
Legal Services (JUS)	2.2
Translation Bureau (SS)	4.1
Records Management & Technical Services (NL)	.7

Internal Management Services (Concl'd.)

Actuarial Services (INS)	.2
Grants in lieu of Taxes on Federal Property (FIN)	41.0
DPW Administration	23.9
	<u>277.6</u>

Government Contributions to Employee Pension and Medical Plans

Contribution to Public Service Superannuation Account	122.6
Contribution to Canada & Quebec Pension Plans	17.6
Group Surgical Medical Insurance Plan and Other Pension Plans	14.3
Government Employees' Compensation (LAB)	2.9
	<u>157.4</u>

CONTINGENCY VOTE

	<u>33.6</u>
National Capital Region	
National Capital Commission	<u>23.9</u>
Bullion and coinage	
Royal Canadian Mint (FIN)	<u>4.0</u>
Other Legislation and Administration	
Territorial Governments	11.0
State Visits	2.3
Statute Revision Commission	<u>13.3</u>
	<u>664.3</u>
Sub Function Total	<u>664.3</u>

PROTECTION OF PERSONS AND PROPERTY

Justice

Justice Departmental Administration and Constitutional Matters	.7
Supreme and Exchequer Court Administration	.7
Judges Salaries and Pensions	11.8
	<u>13.2</u>

Correctional Services

Solicitor General Administration	.9
Correctional Services	57.3
	<u>58.2</u>

Police Protection

Royal Canadian Mounted Police	<u>9.7</u>
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Consumer Services

Food and Drug (NHW)	8.2
Standards Branch (TC)	4.3
Consumer and Corporate Affairs Administration	.7
Consumers (CCA)	.2
	<u>13.4</u>

Other Protection of Persons and Property

Bankruptcy Act (CCA)	.8
Combines Investigation (CCA)	1.2
Canada Corporations Act (CCA)	.2
Supervision of Companies (INS)	1.1
Race Track Supervision (AGR)	1.6
	<u>4.9</u>

Sub Function Total 182.4

FUNCTION TOTAL 846.7

FOREIGN AFFAIRS

\$ millions

EXTERNAL RELATIONS

Diplomatic Relations

External Relations 48.5

Contributions to International Organizations

All Contributions (EA) 15.6

Sub Function Total 64.1

ASSISTANCE TO DEVELOPING COUNTRIES

External Aid Office Administration	2.9
Caribbean Sugar Payments (FIN)	1.1
International Aid (EXT)	15.3
External Aid Office Grants	130.3

Sub Function Total 149.6

FUNCTION TOTAL 213.7

DEFENCE

\$ millions

National Defence Department	1,699.2
Defence Research Board	47.0
Defence Construction Limited	2.3
Canadian Arsenal Limited	.4
Defence Industry Support (DDP)	.4
Defence Industry Technology (DOI)	32.4

DEFENCE (Concl'd.)

Emergency Measures Organization	8.8
Emergency Health Services (NHW)	1.9
Emergency Supply Planning (DDP)	.9

FUNCTION TOTAL	<u>1,793.3</u>
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INTERGOVERNMENTAL FISCAL TRANSFER PAYMENTS

STATUTORY SUBSIDIES TO PROVINCIAL GOVERNMENTS	<u>31.7</u>
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REVENUE EQUALIZATION PAYMENTS	<u>598.4</u>
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OTHER FISCAL TRANSFER PAYMENTS

Payments to Quebec under Established Programs Act and Fiscal Revision Act	134.1
Share of Public Utilities Income Tax	6.7

FUNCTION TOTAL	<u>770.9</u>
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ECONOMIC MEASURES

PRIMARY INDUSTRY

Agriculture

Agriculture Administration	6.5
Health of Animals (AGR)	18.5
Production and Marketing (AGR)	
(Excludes Crop Insurance and Racetrack Supervision)	41.9
Research (AGR)	39.4
Land Irrigation and Water Projects (AGR)	22.8
Board of Grain Commissioners	9.9
Wheat Price Maintenance (TC)	2.7
Canadian Dairy Commission (4)	124.9
Carrying Costs, Temporary Wheat Reserves (TC)	29.3
Canadian Livestock Feed Board	21.6
Farm Credit Corporation	3.8
Farm Improvement Loans Act (FIN)	.3
Agriculture Manpower (MI)	.1
Crop Insurance	2.6
	<u>324.2</u>

Fisheries

Fisheries Administration	3.4
Fisheries Management and Development	33.6
Fisheries Research Board	14.8
	<u>51.8</u>

Forestry

Forestry Program

20.6

Minerals

Roads to Resources

2.8

Energy Mines and Resources Departmental Administration

4.2

Geological Research (EMR)

9.7

Mining and Metallurgical (EMR)

7.7

Gold Mining Assistance Payments (EMR)

13.4

Eastern Coal Subventions (EMR)

3.0

Mineral Development (Excl. Roads, Eastern Coal and Gold Mining Assistance) (EMR)

1.1

43.9

Water Resources

Water Resources (EMR)

49.2

International Joint Commission (EXT)

.4

49.6

Energy

Atomic Energy of Canada Limited (4)

66.5

Atomic Energy Control Board

2.8

Atlantic Development Fund (ADB)

18.6

National Energy Board

1.5

Dominion Coal Board

35.2

124.6

Sub Function Total

614.6

SECONDARY INDUSTRY

Department of Industry Administration

10.3

Advancement of Industrial Technology (DOI)

6.4

Small Business Loans Act (FIN)

.2

Industrial Research Assistance (NRC)

5.1

Patents, Copyrights, Trademarks (CCA)

4.3

Haley Industry Losses and Sale

1.2

Commercial and Fishing Vessels Subsidy (DOI)

39.3

General Incentives for Research and Development (DOI)

2.1

General Incentives for Design (DOI)

Sub Function Total

62.9

TRANSPORTATION AND COMMUNICATIONS

Air Transport

Air Services (DOT)

111.1

Payments to Air Carriers (CTC)

7.0

Civil Aviation Medicine (NIHW)

118.1

Water Transport	
Marine Service (DOT)	93.5
Subsidies to Ferries (DOT)	45.4
National Harbours Board (Excl. J. Cartier Bridge)	6.1
Harbours and Rivers (DPW)	44.0
Saint Lawrence Seaway	10.4
Sick Mariners Service (NIHW)	1.5
Steamship Subventions (CTC)	11.0
	<u>212.9</u>
Rail Transport	
Subsidies to Railways (DOT)	62.1
Railway Subsidies (CTC)	110.0
	<u>172.1</u>
Road Transport	
Trans-Canada Highway (DPW)	66.7
Northumberland Causeway (DPW)	5.0
Northwest Highway (DPW)	7.5
Other Roads and Bridges (DPW)	4.6
Trunk Highways (ADB)	19.3
Jacques Cartier Bridge Deficit (NIHB)	.5
Railway Grade Crossing Fund (CTC)	15.0
	<u>118.6</u>
Postal Services	
Post Office	301.9
Telecommunications	
Research Satellite Program (DND)	3.5
Radio Act and Regulations (DOT)	2.0
	<u>5.5</u>
Other Transportation and Communications	
Department of Transport Administration	6.9
Meteorological Services (DOT)	25.5
Canadian Transportation Commission Administration	3.6
	<u>36.0</u>
Sub Function Total	<u>964.6</u>
SERVICE INDUSTRY	
Tourism	
Travel Development (TC)	10.6
Sub Function Total	<u>10.6</u>

FOREIGN TRADE

Trade and Commerce Administration	1.7
Trade Development (TC)	22.6
World Fairs (TC)	7.5
Foreign Military Marketing (DDP) (including CCC)	4.1
Pacific National Exhibition	1.4
Sub Function Total	<u>37.9</u>

LABOUR FORCE

Working Conditions

Department of Labour Administration	1.8
Labour Standards (LAB)	1.4
Research and Development (LAB)	1.6
Labour Relations (LAB)	1.3
	<u>6.1</u>

Training

Occupational Training for Adults (MI)	10.5
Capital Assistance, Technical and Vocational Schools (MI)	119.0
Technical and Vocational Training (MI)	85.6
	<u>309.1</u>

Immigration

Immigration (MI)	21.7
Immigration Medical Services (NHW)	2.1
Citizenship Registration (SS)	1.8
Immigration Appeal Board	.3
Immigrant Integration (Citizenship Branch - SS)	.7
	<u>26.6</u>

Other Labour Force

M & I Departmental Administration	4.2
Employment Services (MI)	36.2
Manpower Mobility	3.3
Employment Stabilization	22.0
Manpower Administration	4.3
Program Development (Mf)	7.0
	<u>87.0</u>

Sub Function Total 41.3

GENERAL RESEARCH

Social Science Research

Dominion Bureau of Statistics	1.2
Economic Council	1.0
	<u>2.2</u>

Physical Science Research

NRC University Grants	45.5
National Research Council	50.5
Scientific Council (PC)	.4
Astronomy and Physics (EMR)	6.0
Polar Continental Shelf (EMR)	1.8
	<u>104.2</u>
Sub Function Total	<u>128.3</u>

HOUSING AND URBAN RENEWAL

Contributions to Urban Renewal Schemes (CMHC)	8.0
Sewage Treatment Projects (CMHC)	7.9
Losses, Operation of Public Housing Projects (CMHC)	2.4
Housing Research & Community Planning (CMHC)	3.1
Municipal Development Loan Board	1.2
	<u>22.6</u>
Sub Function Total	<u>22.6</u>

REGIONAL DEVELOPMENT

Rural Development (ARDA etc. excl. FRED) (FRD)	31.4
FRED (FRD)	5.7
Cape Breton Development Corporation (EMR)	
Northern Administration (excl. Territorial Gov't) (IAND)	55.6
ADB Administration	2.2
Dosco Special Vote (ADB)	2.0
Grants Scholarships and Bursaries for Industrial and Area Development (DOI)	.2
Area Development Incentive Grants (DOI)	15.4
	<u>112.5</u>
Sub Function Total	<u>112.5</u>

OTHER ECONOMIC MEASURES

Forestry Departmental Administration (FRD)	1.7
Field and Air Surveys (EMR)	10.9
IAND Departmental Administration	2.4
	<u>15.0</u>
Sub Function Total	<u>15.0</u>

FUNCTION TOTAL 255.8

SOCIAL MEASURES

\$ millions

HEALTH

Public Health

General Health Grants (NHW)	29.6
Grants to Health Organizations (NHW)	.2
Quarantine Services (NHW)	.7
Public Health Sanitarian Services (NHW)	.2
	<u>30.7</u>

Medical Care

Health Resources Fund (NHW)	32.6
Medical Research Council (NRC)	20.7
	<u>53.3</u>

Hospital Care

Hospital Insurance Grants (NIHW)	468.6
Hospital Construction Grants (NIHW)	16.4
	<u>485.0</u>

Other Health

Northern Health Services (NIHW)	9.0
NHW Department Administration	3.6
Health and Medical Activities Administration (NIHW)	10.2
	<u>22.8</u>

Sub Function Total 591.8

INCOME MAINTENANCE

Payments to Families

Family Allowances (NIHW)	558.9
Youth Allowances (NIHW)	49.5
Family Assistance Payments (NIHW)	4.2
	<u>612.6</u>

Payments to Unemployed

Unemployment Insurance Administration	37.6
Government's Contribution to UIC Fund	68.8
Auto Workers, Transitional Assistance (LAB)	.7
	<u>107.1</u>

Sub Function Total 719.7

SOCIAL ASSISTANCE

Canada Assistance Plan

232.1

Aid to Handicapped

Rehabilitation Services (NHW)	
Disabled Persons Allowances (NHW)	.6
Blind Persons Allowances (NHW)	7.1
Vocational Rehabilitation, Disabled Persons (MI)	2.3
	<u>2.4</u>
	<u>12.4</u>

Other Social Assistance

Welfare Activities Administration (NHW)	
Old Age Assistance (NHW)	8.4
Company of Young Canadians (SS)	8.9
Vanier Institute (FIN)	2.4
Mental Retardation Grants (NHW)	.8
Special Assistance Bell Island (ADB)	.3
Governments Annuities Act (LAB)	.3
National Welfare Grants	1.1
	<u>1.1</u>
	<u>24.1</u>

Sub Function Total 268.6

VETERANS BENEFITS

Veterans Affairs Administration	
Pensions (DVA)	5.5
Treatment Services (DVA)	202.1
Veterans' Land Act	60.7
Welfare Services (DVA)	9.2
	<u>114.2</u>

Sub Function Total 391.5

INDIANS & ESKIMOS

Indian Programs (IAND)	
Indian Health Service (NHW)	1.2
Indian Integration (Citizenship Branch - SS)	25.2
	<u>2</u>

Sub Function Total 48.1

FUNCTION TOTAL 212.0

EDUCATION, CULTURE AND RECREATION

AID TO EDUCATION

Post Secondary Education Transfer Payments	
Education Grants (SS)	10.0

Other Aid to Education

Student Loans (FIN)	5.1
	<u>8.1</u>

Sub Function Total 18.1

CULTURE AND RECREATION

Archives, Galleries, Theatres, Etc.

Canada Council	
Other National Museums	16.9
National Gallery	3.8
Public Archives	2.9
National Library	1.5
National Arts Centre	1.6
City of Ottawa for Civic Centre	20.6
	<u>.4</u>
	<u>47.5</u>

PARK, HISTORIC SITES, AND OTHER RECREATIONAL AREAS

National Parks and Historic Sites (IAND)	33.9
Canadian Wild Life Service (IAND)	3.7
	<u>37.6</u>

FILM, RADIO AND TELEVISION

Canadian Broadcasting Corporation	144.0
National Film Board	9.3
Canadian Radio – Television Commission	1.3
Canadian Film Development Corporation (SS)	
	<u>154.6</u>

OTHER CULTURE AND RECREATION

Secretary of State Department Administration	1.9
Fitness and Amateur Sport (NHW)	4.1
Grant to Ottawa YMCA (FIN)	
Citizenship Branch (SS) (Excludes Indian and Immigrant Integration)	1.1
Centennial Commission	31.2
Cité du Havre expenditures	
	<u>38.3</u>

Sub Function Total 278.0

FUNCTION TOTAL 391.9

PUBLIC DEBT

\$ millions

Interest and Annual Amortization of Bond Discount Premiums & Commissions	1,294.1
Servicing Costs & Costs of Issuing New Loans	4.5
	<u>1,298.6</u>
FUNCTION TOTAL	<u>1,298.6</u>

APPENDIX C

DISTRIBUTION OF COSTS OF ADMINISTRATIVE PROGRAMS AND ACTIVITIES

- 1 Many departments, particularly the large ones, will want to have an administration program containing the central headquarters activities involved in operating the department as an entity. In some applications of PPB theory, the costs of an administration program would be distributed to each activity in the other programs according to the "service" the administration program supplies to the activity. This approach could easily occasion the creation of very elaborate costing systems since costs originally incurred by the Personnel Division, for instance, would have to be charged to every other activity in the department for each employee recruited. This would include the costs of issuing a poster, holding competition boards, paying removal allowances and processing certificates of appointment. Similarly the costs of preparing financial statements by a Financial Management Division in the Administration program and the costs of work measurement studies by an Organization and Methods Division would have to be financed through the funds supplied to "line" programs.
- 2 As mentioned in Chapter 1 of this guide, the Canadian PPB System has not been developed along these lines. The concepts which are being adopted are
 - (a) that administrative programs and activities should contain only those activities which naturally belong there; and
 - (b) administration costs should be justified in terms of the burden placed on administration by the non-administrative programs and activities.
- 3 Typically, the administration program costs should include the funds necessary for the Minister's and Deputy Minister's offices and for the divisions or sections for personnel, program analysis, financial management, organization and methods, forms control, forms management, and office services. In most cases operations such as the departmental library will also fall within the Administration program as will small, general purpose, data processing units. Normally all the activities which the department has decided to place in the central administration responsibility structure (for organizational purposes) will not automatically belong in the Administration program. If an activity wholly or primarily serves one of the other programs of the department, for costing purposes it should be shown as forming part of that other program.
- 4 With respect to the support of changes in administrative costs because of the burden placed on administration by other programs and activities, the following example may serve to illustrate the general approach.
- 5 Suppose, a department has four programs:
 - (a) Administration
 - (b) Research
 - (c) Operations A
 - (d) Operations B

The department would then estimate, in percentage terms, the relative burden placed by the last three programs on the administration program – e.g.:

	Burden on Administration Program
Research	30 %
Operations A	24 %
Operations B	46 %
	100 %

These percentages would have been obtained by estimating the burden on each activity in the administration program as illustrated in the following table.

	Activities in Administration Program					Total Cost of Administration Program
	Senior Management	Personnel Division	Financial Management Division	Organization & Methods Division	Office Services	
Current annual cost (\$000)	45	170	150	100	85	550

	Percent Burden per Administration Activity					Weighted Total (\$000)
Research	20	45	25	0	50	165.5
Operations A	40	15	35	10	30	131.5
Operations B	40	40	40	90	20	253.0
	100	100	100	100	100	550.0

6 The percentages shown in the above table do not need exact study for their estimation. In personnel, for instance, the rate of staff turnover in each of the three programs is probably an adequate estimate, with some adjustment for the more difficult staffing problems occasioned in some programs. Good informal guesses with some attention to each administration activity's records should serve in deriving adequate estimates. The method of deriving the weighted total for a program is illustrated for the case of the Research Program.

$$(20 \times 45) + (45 \times 170) + (25 \times 150) + (50 \times 85) = \$165.5 \text{ (000)}$$

7 The financial allocation to an administration program will therefore generally be based on the allocation made to the programs administered in terms of the burden these other programs place on administration. This principle may be best conveyed by an illustration. Let us assume the hypothetical program structure mentioned above and assume the costs of these programs and the additional allocations as shown:

	Current Year Cost	Burden on Admin.	Additional Allocation		Tentative Additional Allocation to Admin.
	(1) \$000's	(2) \$000's	(3) \$000's	(4)	(5) (2) x (4)
Administration	500				
Research	20,000	165.5	5,000	25%	41.4
Operations A	10,000	131.5	1,000	10%	13.2
Operations B	30,000	253.0	6,000	20%	50.6
					<u>105.2</u>

Thus the apparent additional required financial allocation for Administration would be \$105,200.

- 8 The final allocation could of course be different for the following kinds of reasons:
- The additional allocation to a non-administration program may take the form of additional money for grants and construction which need not increase the burden on Administration. If no increase in the administrative burden is expected, an increased allocation to the non-administration program would not justify an increase in the administration program.
 - There may be a valid reason for increasing the amount allowed for the administration program regardless of what happens in the other programs because of the introduction of new work e.g. the initiation of staff training in a department which had no training capability in the past, exceptionally high recruiting costs in a high demand field of specialization, etc.

APPENDIX D

AN ILLUSTRATION OF COST-BENEFIT ANALYSIS*

1 As a simplified example of a cost benefit analysis, this section will analyse two approaches to a hydro power generation program. It must be assumed that the basic decision in favour of hydro power has already been made and that there are only two technically feasible solutions to the problem.

2 For the purpose of this expository example it will also be assumed that two different river systems are involved and each alternative is only feasible on one system.

System A: The construction of a series of small dams which can be built to generate power at 10, 20, 30, 40, 50 or 60 megawatts.

System B: The construction of a single large dam which, depending on height and location, can be built to generate power at 75, 90, 100, 125, 150 or 200 megawatts.

A further complication is introduced in system A since there is only one site from which power can be generated in the 30 to 60 megawatt range although there are a number of possible sites for smaller dams.

3 Before making a choice between A and B it is necessary to determine the best possible scale for each. The following table (CI) summarizes the data provided to deal with system A:

4 Two columns in particular should be noted, the fourth showing net benefits and the last showing the ratio of incremental benefits to incremental costs. This ratio $\Delta B/\Delta C$ shows what may be expected in additional benefits for additional expenditures and as long as it is greater than 1.0, the additional benefits accruing will exceed the additional costs incurred to obtain these benefits. It is apparent that the optimum scale for alternative A is reached at 40MW since each increase in expenditures beyond this point would exceed the benefits obtained. The optimum scale under alternative A would therefore appear to be the 40MW project. A similar argument, not reproduced here, indicates that the optimum scale for project B is a 100MW project at a cost of \$27.9 million and with benefits of \$44.5 million.

5 The costs included in this first stage of the analysis would be the capital investment and future operating costs of the dams and the benefits would be measured at the price at which the power generated would be sold.

* This illustration is suggested by one appearing in the publication "Guide to Benefit-Cost Analysis" by W.R.D. Swell, J. Davis, A.D. Scott and D.W. Ross, available from the Queen's Printer and Comptroller of Stationery, price \$1.25. Different numerical values are used here to permit abbreviation of the illustration.

Scale	Costs	Benefits	Net Benefit	Benefit Cost Ratio	Incremental Costs ΔC	Incremental Benefits ΔB	Ratio $\Delta B / \Delta C$
MW	S000,000		S000,000		S000,000		
10	4.0	5.5	1.5	1.38	—	—	—
20	7.6	10.7	3.1	1.41	3.6	5.2	1.44
30	10.9	15.6	4.7	1.43	3.3	4.9	1.48
40	14.1	20.2	6.1	1.43	3.2	4.6	1.44
50	19.0	24.5	5.5	1.29	4.9	4.3	.88
60	23.7	28.5	4.8	1.20	4.7	4.0	.85

TABLE C I

Cost data for system A

(Note:— It is assumed that beyond a capacity of 60MW the unit cost/Kwh remains constant.)

- 6 We must next assess the expected demand. It is assumed that the demand would start in year one at 10MW and grow regularly to 100MW by year ten and remain constant at this level thereafter. This demand would appear to be best met by:

Alternative A: One 40MW project and three 20MW projects,

Alternative B: One 100MW project.

- 7 Alternative A appears the more attractive at first sight since the small projects can be built roughly as needed in step with the growth in demand while B must be built in one operation at the beginning of the project. To resolve this question, the present value of the following series of expenditures and benefits must be calculated.

(a) The present value of the four capital investments in A, incurred as they become necessary with the growth in demand.

(b) The present value of the benefits.

(c) The present value of the operating and maintenance costs of A.

(d) The present value of the operating and maintenance costs of B.

- 8 It immediately becomes apparent that we must ask a lot more questions before starting the detailed analysis:

(a) What is the interest rate to be used? For the purpose of this example let us assume 5%.

(b) How long does it take to build a dam? Let us assume that one year after the money has been encumbered we can start selling power.

(c) How much will operation and maintenance cost? Let us assume \$1 million per dam per year.

(d) Is it permissible to allow the demand to wait on supply or must it be met as it arises? Let us assume that the demand must be met within one year of its arising.

(e) What is the working (financial) life of the project? Let us assume 20 years in calculating the income per year.

In practice few of these questions have simple answers but for the purposes of this example it is necessary to make some sweeping assumptions.

- 9 Looking at project A we must decide on what order to use in our construction program. To avoid violating the demand assumption in (d) above, it is necessary to build something immediately. It is also necessary to decide on whether to build to anticipate requirements, or to meet existing requirements. For instance if we start by building the 40MW dam this will be satisfactory until the end of year four. Do we then build a 20MW dam during year four to meet the anticipated demand in year five or build during year five to meet our commitment under criterion (d) and the demands of year six.

- 10 Consider building during year four as case X, during year five as case Y. Table CII demonstrates the simple analysis necessary to determine that building during year five is a better financial proposition and still satisfies the requirement that the demand must be met within one year of its arising.

Alternative X

Year	Expenditure \$000,000	Income \$000,000	Net Income \$000,000	Present Value in year 4 \$000,000
4	7.60	—	- 7.60	- 7.60
5	.10	.09	- .01	- .01
6	.10	.17	+ .07	+ .06
7	.10	.17	+ .07	+ .06

Net Present Value
at year 4
- \$7.49 million.

Alternative Y

Year	Expenditure \$000,000	Income \$000,000	Net Income \$000,000	Present Value in year 4 \$000,000
4	—	—	—	—
5	7.60	—	- 7.60	- 6.89
6	.10	.17	+ .07	+ .06
7	.10	.17	+ .07	+ .06

Net Present Value
at year 4
- \$6.77 million.

TABLE C II

Comparison between building in year four or year five to satisfy demand in years five and six.

(NOTE: Both alternatives are identical beyond year six.)

Year	Demand MW	Const. Schedule MW	Const. Cost \$000,000	Maint. Cost \$000,000	Income \$000,000	Net Income \$000,000	Present Value \$000,000	Total Present Value \$000,000
1	10	40	14.1			- 14.100	- 13.429	
2	20			.100	.535	+ .435	+ .395	
3	30			.100	.780	+ .680	+ .587	
4	40			.100	1.010	+ .910	+ .749	
5	50	20	7.6	.100	1.010	- 6.690	- 5.242	
6	60			.200	1.425	+ 1.225	+ .914	
7	70	20	77.6	.200	1.425	- 6.375	- 4.531	
8	80			.300	1.825	+ 1.525	+ 1.032	
9	90	20	7.6	.300	1.825	- 6.075	- 3.916	
10	100			.400	2.225	+ 1.825	+ 1.120	- 22.321
11-20	100			. 40p.a.	2.285p.a.	+ 1.825p.a.	+ 8.651	- 13.670
21-30	100			. 40p.a.	2.225p.a.	+ 1.825p.a.	+ 5.311	- 8.359
31-40	100			. 40p.a.	2.225p.a.	+ 1.825p.a.	+ 3.261	- 5.098
41-50	100			. 40p.a.	2.225p.a.	+ 1.825p.a.	+ 2.002	- 3.096

TABLE C III
Net Present Value of System A

- 11 It is now possible to establish a construction schedule for alternative A and look at the overall cost. Table CIII shows the development of net present value calculated from the construction cost, an estimate of maintenance costs, predicted income from the sale of power and the reduction of all these future values to the present which is taken to be at the beginning of year one. It will be seen that the net present value even after 50 years is still negative, and in fact it will take about 70 years to break even if the sale of power is the only benefit considered.
- 12 Table CIV shows a similar calculation for alternative B which gives a break even point after 40 years with an ever increasing net benefit beyond this point. At the same time the benefit cost ratio, which can be calculated for any time period as

Present Value of benefits

Present Value of capital costs + Present Value of operation and maintenance costs

is consistently larger than for alternative A

- 13 It must be realized that for most government projects it is most unlikely that a calculation of this type would be the only factor taken into consideration before a decision is made. There may well be limitations with regard to the amount of farmland which may be taken out of production, the resettlement of displaced farmers, recreational values, transportation and access problems etc. As far as possible these factors should be quantified and reduced to monetary values in an effort to establish a common measure for the analysis.
- 14 In conclusion it must be pointed out that this is a simplified approach to a problem which had itself been simplified. In practice the assumptions made would have to be carefully examined and would probably be the subjects of studies in their own right. The calculations would have to be repeated for different interest rates, different power demands and possible changes in the overall criteria; for example, supply could be allowed to lag behind demand for two years rather than for one. The entire problem must in fact be subjected to sensitivity analyses for all these variables to determine whether or not the overall decision or ranking of preferences would be affected by changes in the assumptions.

Year	Demand MW	Const. Schedule MW	Const. Cost \$000,000	Maint. Cost \$000,000	Income \$000,000	Net Income \$000,000	Present Value \$000,000	Total Present Value \$000,000
1	10	100	27.9			- 27.9	- 26.571	
2	20			. 20	.535	+ .335	+ .304	
3	30			. 20	.780	+ .580	+ .501	
4	40			. 20	1.010	+ .810	+ .666	
5	50			. 20	1.225	+ 1.025	+ .803	
6	60			. 20	1.425	+ 1.225	+ .914	
7	70			. 20	1.625	+ 1.425	+ 1.013	
8	80			. 20	1.825	+ 1.625	+ 1.047	
9	90			. 20	2.025	+ 1.825	+ 1.120	
10	100			. 20	2.225	+ 2.025	+ 1.243	- 18.960
10-20	100			. 20 p.a.	2.225 p.a.	+ 2.025 p.a.	+ 9.599	- 9.361
21-30	100			. 20 p.a.	2.225 p.a.	+ 2.025 p.a.	+ 5.893	- 3.468
31-40	100			. 20 p.a.	2.225 p.a.	+ 2.025 p.a.	+ 3.618	+ .150
41-50	100			. 20 p.a.	2.225 p.a.	+ 2.025 p.a.	+ 2.221	+ 2.371

TABLE C IV
Net Present Value of System B

APPENDIX E

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